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DECLARATION

I, Jeffrey C. Barfield of Ahornstrasse 17, 82377 Penzberg, Germany, do hereby declare that I am conversant with the English and German languages and that I am a competent translator thereof.

I verify that the attached English translation is a true and correct translation of the Annex to the international provisional examination report of November 21, 2000 in connection with the international patent application PCT/EP99/07438.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: April 3, 2001

Jeffrey C. Barfield

V. Justified determination in accordance with Rule 66.2(a)(ii)

2. Reference is made to the following documents:

D1: US-A-5 511 599 (WILLARD JR WALTER L) April 30, 1996
D2: EP-A-0 822 105 (MICHELIN RECH TECH) February 4, 1998

2.1 Document **D2** is seen as the closest prior art with respect to the subject of claim 1. It discloses (see Fig. 4) a vehicle tire having the features of the preamble to claim 1.

The subject of claim 1 differs from this known vehicle tire in that

(a) the three rubber reinforcing plies extend, starting from the beak apex region, with mutually displaced ends up to and beneath the edge region of the belt plies, and
(b) all rubber reinforcing plies and also the bead apex consist of the same rubber mixture,
(c) whose modulus of elasticity (E*) of the rubber reinforcing plies (4, 5, 6) and also of the bead apex (9) is the same as or greater than 9 MPa when measured at 70°C and the tanδ is the same as or smaller than 0.03, and indeed measured by means of "Eplexor" at 10 Hz, 10 % prestress and 1 % DSA.

The subject of claim 1 is thus novel and meets the requirements of Article 33(2) PCT.

The object to be satisfied with the present invention can be seen in that the geometry are the exact material parameters of the rubber reinforcing plies are given.

The way proposed to satisfy this object in claim 1 of the present application appears to be based on an inv ntive st p for th following reasons (Article 33(3) PCT:

While the differences introduced by features (a) and (b) may not be capable of justifying a sufficient inventive step, particularly since the differences they produce are made obvious by D2 and also D1, the parameters given in feature (c) are not known from the present prior art and appear to be inventive.

It must be stated with respect to feature (a) that D2 (see Fig. 4) clearly shows that the first and a second rubber reinforcing ply extend up to and beneath the belt; however, with respect to the third rubber reinforcing ply, it can only be seen from D2 that this (*see page 7, lines 48 – 50)* overlaps with the "tread reinforcing package". Since a so-called "tread reinforcing package" can contain further parts, such as a cap ply overlapping the belt, in addition to th belt, it thus cannot be clearly seen from D2 whether the overlapping in question must necessarily be an overlapping with the belt. However, it must be noted that despite the unclear statements of D2, one skilled in the art will, however, at least take into consideration the extending of also the third rubb r reinforcing ply up to and beneath the belt. With respect to feature (b), it also seems obvious, in view of the teaching of D2, to likewise use the same rubber mixture for the three rubber reinforcing plies and the bead apex, since D2 proposes using mixtures with substantially the same material properties (*see page 10, lines 22 – 24*).
Feature (c), in contrast, is not made obvious by the data of D2 or D1. For instance, no data can be found in D2 in particular with respect to the material parameter tanδ, which would anticipate or make obvious the proposed solution, which provides for a value of less than 0.03.

2.2 Claims 2 to 17 are dependent on claim 1 and thus likewise meet the requirements of the PCT with respect to novelty and inventive step.

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Patent Claims

1. Pneumatic vehicle tires comprising a multi-ply carcass, which extends between two bead cores (8) having associated bead apexes (9), a belt arrangement provided between the carcass plies (1, 2, 3) and a tread strip and also rubber reinforcing plies (4, 5, 6) arranged in the side wall regions, which take on a supporting function with a deflated tire, wherein a first rubber reinforcing ply (4) is arranged radially inside a first carcass ply (1), a second rubber reinforcing ply (5) is arranged between the first carcass ply (1) and a second carcass ply (2), a third rubber reinforcing ply (6) is arranged between the second carcass ply (2) and a third carcass ply (3), and the three rubber plies (4, 5, 6) have a different height in the radial direction and different thicknesses over the height of the side wall; and wherein the radially inner end regions of all three rubber plies (4, 5, 6) are disposed on the axially inner side of the bead apex (9), and the ends (11) of the radially innermost, first, carcass ply (1) are led around the respective bead core (8) and are overlappingly connected to the respective end (12) of the outer, third, carcass ply (3), and the middle carcass ply (2) terminates axially inside the bead apex (9) adjacent to the respective bead core (8), characterized in that the three rubber reinforcing plies (4, 5, 6) extend, starting from the bead apex region, with mutually displaced ends up to and beneath the edge region of the belt ply (10); and in that all rubber reinforcing plies (4, 5, 6) and also the bead apex (9) consist of the same rubber

mixture whose modulus of elasticity (E*) of the rubber reinforcing plies (4, 5, 6) and also of the bead apex (9) is the same as or greater than 9 MPa when measured at 70°C and the tanδ is the same as or smaller than 0.03, and indeed measured by means of "EPLEXOR": 10 Hz, 10 % prestress and 1 % DSA (double strain amplitude).

2. Pneumatic vehicle tires in accordance with claim 1, characterized in that all three rubber reinforcing plies (4, 5, 6) have a different thickness over their height and the middle rubber reinforcing ply (5) has a lesser thickness over an at least predominant part of the side wall height in comparison to the inner and outer rubber reinforcing plies (4, 6).

3. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that the tread side ends of the rubber reinforcing plies (4, 5, 6) terminate with an increasing distance from the central plane (13) of the tire, starting from the radially innermost ply (4).

4. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that the radially inner end of the radially outer rubber reinforcing ply (6) contacts the inner side of the bead apex (9).

5. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that radially inner end of the outer rubber reinforcing ply (6) is simultaneously formed as a bead apex.

6. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that all rubber reinforcing plies (4, 5, 6) are made so that they taper to a tip at their free ends in the cross-section.

7. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that the central carcass ply (2) is connected in a region lying above the bead core (8) to the radially inner carcass ply (1).

8. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that the carcass plies (1, 2, 3) consist of rayon.

9. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that the belt plies (10) consist of Kevlar or steel.

10. Pneumatic vehicle tires in accordance with claim 9, characterized in that the belt is stiffened by additional rubber between the belt plies.

11. Pneumatic vehicle tires in accordance with claim 1, characterized in that the hardness IRHD of the rubber reinforcing plies (4, 5, 6) and also of the bead apex (9) are the same as or greater than 80 when measured at room temperature, with the measurement taking place in accordance with DIN 53915 and with small samples taken from the tire being measured.

12. Pneumatic vehicle tires in accordance with claim 1, characterized in that at least the rubber reinforcing plies (4, 5, 6) consist of a rubber mixture which is composed of a polymer mix of NR/IR and BR with at least 50 parts NR/IR, a carbon black content of 50 to 60 parts, 5 to 8 parts zinc oxide, 2 parts stearic acid, 1.5 parts aging protection agent, and also at least 1 part of vulcanization accelerator and sulfur, with the sulfur proportion preferably including 4 or 5 parts and with rapidly injectable FEF carbon black preferably being used as carbon black.

13. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that the rubber reinforcing plies (4, 5, 6) having a continuously changing thickness, have in total their greatest thickness in the region of the half side wall height, and also in the upper third of the side wall height.

14. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that, when measured at approximately two thirds of the side wall height and at the half side wall height, the thickness of the inner rubber reinforcing ply (4) amounts to 3.0 mm and 3.2 mm respectively, the thickness of the middle rubber reinforcing ply (5) amounts to 2.8 and 2.9 mm respectively, and the thickness of the outer rubber reinforcing ply (6) amounts to 2.9 and 3.3 mm respectively, with a tolerance of ± 0.5 mm applying to all measured values.

15. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that, when measured in the region of maximum bead thickness (side wall height W), the thickness of the inner rubber reinforcing ply (4) amounts to approximately 2.5 mm, the thickness of the central rubber reinforcing ply (5) amounts to approximately 1.9 mm and the thickness of the outer rubber reinforcing ply (6) amounts to approximately 6.9 mm, with a tolerance of ± 0.5 mm applying to all measured values.

16. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that, when related to the axially outer edge of the breaker (10), the belt side end of the inner rubber reinforcing ply (4) is spaced by approximately 33 mm, the belt side end of the middle rubber reinforcing ply (5) is spaced by approximately 22 mm and the belt side end of the outer rubber reinforcing ply (6) is spaced by approximately 15 mm, with a tolerance of ± 2.5 mm applying to these measured values.

17. Pneumatic vehicle tires in accordance with one of the preceding claims, characterized in that the crown thickness (A2) measured at the center of the tire is 17.5 ± 0.8 mm and the tire thickness (C2) measured in the transition region of the shoulder and in the region of the ends of the rubber reinforcing plies (4, 5, 6) amounts to 18.5 ± 1.0 mm.

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Pneumatic Vehicle Tires

The invention relates to pneumatic vehicle tires of the kind described in the preamble to claim 1.

A pneumatic vehicle tire of this kind is known from EP 0 822 105 A2. Furthermore, a similar pneumatic vehicle tire is described in US-PS 5,511,599. By means of such tires it is possible, in the event of a tire puncture, to travel larger distances at adequate speed, even with a deflated tire, before repair of the tire or a tire change has to be effected. Such tires accordingly increase the safety in the event of a tire puncture and make it possible to reach the next repair shop without problem, so that undesired and also dangerous tire changing on roads with heavy traffic can be avoided.

The object of the present invention is to design a pneumatic vehicle tire of the initially named kind so that even in the deflated state a long distance can be traveled at an adequately high speed, so that the stiffening rubber plies in the side walls do not disturbingly impair the driving comfort of the tire operated at normal pressure and so that the tire weight remains as low as possible.

This object is satisfied starting from a pneumatic vehicle tire of the kind initially mentioned in that the three rubber reinforcing plies extend, starting from the bead apex region, with mutually displaced ends up to and beneath the edge region of the belt ply; and in that all rubber reinforcing plies and also the bead apex consist of the same rubber

mixture whose modulus of elasticity of the rubber reinforcing plies and also of the bead apex is the same as or greater than 9 MPa when measured at 70°C and the tanδ is the same as or smaller than 0.03, and indeed measured by means of "EPLEXOR": 10 Hz, 10 % prestress and 1 % DSA (double strain amplitude).

As a result of the choice of the rubber mixture, of the thickness profile of the rubber reinforcing plies and of the differing hardening times of these rubber reinforcing plies in dependence on the position of the rubber reinforcing plies in the tire, ideal values are obtained with respect to the long running characteristics with the deflated tire. The hardness IRHD of these rubber reinforcing plies and also of the bead apex should be equal to or greater than 80 when measured at room temperature. The measurement of the IRHD (International Rubber Hardness Degree) thereby takes place analogously to the Shore hardness measurement, but with a ball like measuring tip. The measurement or testing thereby takes place in accordance with DIN 53519, with the so-called microhardness being determined, since small samples are measured which are taken from the respective tire.

The rubber reinforcing plies and bead apex are preferably manufactured from a rubber mixture which consists of a polymer mix of NR/IR and BR, with at least 50 parts of NR/IR being contained in this polymer mixture, a carbon black content of 50 to 60 parts, preferably a rapidly sprayable FEF carbon black, as well as 5 to 8 parts of zinc oxide, 2 parts of stearic acid,

1.5 parts of aging protecting agent and also one or more parts of vulcanization accelerator and sulfur (preferably 4 to 5 parts) in order to keep the loss characteristics of the mixture low. All parts are parts by weight.

An advantageous embodiment is characterized in that all rubber reinforcing plies taper to a tip at their free ends in cross-section.

In the event that the radially inner end of the outer rubber reinforcing ply is simultaneously formed as a bead apex, provision is made that, when measured in the region of the maximum bead thickness (side wall height W), the thickness of the inner rubber reinforcing ply is approximately 2.5 mm, the thickness of the middle rubber reinforcing ply is approximately 1.9 mm, and the thickness of the outer rubber reinforcing ply amounts to 6.9 mm, with a tolerance of +/- 0.5 mm applying for all measured values.